Claims

1. (currently amended) ~~Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distiguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer), comprising an arrangement of
~~1.1 comprising at least~~ three polarizing beam splitting layers Pi (i=1,2,3[[,..]]);
the position of each of said ~~layers possessing~~ Pi ~~a~~ described by its unit normal vector Ni, and its position vector Li; ~~normal to Pi and a layer vector Vi coplanar to Pi, said Vi together with the optical axes if incidence and reflexion of Pi defining which directions of polarization of the electromagnetic radiation incident on Pi will be reflected (polarizing reflexion) resp. will transmit Pi (polarizing transmission) such that Vi together with the axis of reflexion of Pi span the plane of polarization of the reflected beam and Vi together with the axis of incidence of Pi span a plane, which is perpendicular to the plane of polarization of the transmitting beam;~~
the polarization beam splitting characteristics of Pi described by a polarizing layer vector Vi coplanar to Pi such that light incident on Pi in Li along an incidence vector Ti is split into a transmitted beam with the plane of polarization POPtrans: $((Vi \times Ti) \times Ti) \circ (\chi - Li) = 0$ and a reflected beam (the according reflection vector Ri being described by $Ri=Ti - 2(Ti \circ Ni)Ni)$ with the POPref: $(Vi \times Ri) \circ (\chi - Li) = 0$, with $(a \circ b)$ being the scalar product of the two vectors a and b and with $(a \times b)$ being the cross product of the two vectors a and b;
P1 and a given axis vector A1 defining axis vector $A2= A1 - 2(A1 \circ N1)N1$, and the planes E1: $(V1 \times A1) \circ (\chi - L1) = 0$ and E3: $(V1 \times A2) \circ (\chi - L1) = 0$;
~~1.2 polarizing layers P1 and~~ P2 being arranged relative to said P1 and said ~~along a first optical axis~~ A1 such that ~~V1 of P1 together with A1 span a plane E1 that is perpendicular to the plane E2 spanned by V2 of P2 and A1 (designated by the term „mutual complementarity" of P1 and P2);~~
$L2 = L1 + d2 * A1$;
$(V2 \times A1) \circ (V1 \times A1) = 0$; (plane E2: $(V2 \times A1) \circ (\chi - L2) = 0$ being perpendicular to plane E1);
~~1.3 polarizing layers P1 and~~ P3 being arranged relative to said P1 and said

~~along a second optical axis~~ A2 such that ~~V1 of P1 together with A2 span a plane E3 that is perpendicular to the plane E4 spanned by V3 of P3 and A2 (designated by the term „mutual complementarity" of P1 and P3),~~
L3 = L1 + d3 * A2;

(V3 × A2) ∘ (V1 × A2) =0; (plane E4: (V3 × A2) ∘ (χ - L3) = 0 being perpendicular to plane E3).

~~1.4 optical axes A1 and A2 intersecting in P1, cutting angle between N1 and S1 equalling cutting angle between N1 and S2,~~

~~1.5the polarizing layers being positioned such that reciprocal polarization is achieved, characterized by a transmission at P1 being coupled to a reflexion at P2 along the axis A1 and a reflexion at P1 being coupled to a transmission at P3 along the axis A2 are coupled (designated by the term „reciprocal polarization").~~

2. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1, said polarization layers Pi being cartesian polarizers, ~~characterized by having their polarization planes selectable independently from the plane of incidence,~~ and said polarization layers Pi being arranged in planes which are perpendicular to a common ground plane, and all said optical axes being coplanar to a common ground plane.

3. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 2, said polarizing layer vector V1 of P1 and said polarizing layer vector V2 of P2 being perpendicular to each other.

4. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 3, said polarizing layers P2 and P3 forming a common polarization layer.

5. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1, comprising

~~5.1~~ ~~comprising~~ at least one right triangular prism ~~(with all lateral surfaces perpendicular to its footprint) with a triangular footprint~~ composed of two

right prisms ~~(with all lateral surfaces perpendicular to the footprint)~~ T1 and T2 each with an isosceles triangular ~~footprint ,~~ base;

~~5.2~~ the lateral surface of sub-prism T2 in-between the two sub-prisms carrying a cartesian polarization layer P1[[,]];

~~5.3~~ the lateral surface of subprism T1, which together with a lateral surface of sub~~prims~~-prism T2 forms a common lateral surface of ~~the compound~~ said composed prism, carrying a cartesian polarization layer P2.

6. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1, comprising ~~containing at least~~ a right prism ~~(with all lateral surfaces perpendicular to its footprint)~~ with an isosceles triangular ~~footprint~~ base ;
the two lateral surfaces of equal size of said prism carrying mutually complementary polarizations layers.

7. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1,
comprising an additional fourth polarization layer P4 which together with said P2 ~~along a third optical axis A3~~ and ~~together~~ with said P3 ~~along a fourth optical axis A 4~~ constitutes an additional cross-polarizer according to claim 1.

8. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 7,
polarization layers P1 and P4 having parallel polarizing layer vectors and being coplanar ~~within a common plane E1~~, and the polarization layers P2 and P3 having parallel polarizing layer vectors and being coplanar ~~within a common plane E2~~, and ~~E1 and E2~~ all four layers having an intersection line ~~where all four polarization layers meet~~.

9. (withdrawn amended) ~~Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distiguished by~~
Complex polarizer system for reciprocal polarization (cross-polarizer) comprising
~~9.1~~ ~~comprising~~ at least two polarizing layers Pi (i=1,2,...)[[,]];
said ~~layers each possessing~~ Pi characterized by a normal vector Ni normal to Pi and a polarizing layer vector Vi coplanar to Pi; [[,]]
said Pi having beam splitting properties, which split an incident beam into a transmitting and a reflected beam;

said Vi ~~together with the optical axis if incidence and reflection of Pi defining which directions of polarization of the electromagnetic radiation incident on Pi will be reflected (polarizing reflexion) resp. will transmit Pi (polarizing transmission) such that Vi together with the axis of reflexion of Pi span the plane of polarization of~~ and the reflected beam spanning the plane of polarization of the reflected beam;

~~and~~ said Vi ~~together with the axis of incidence of Pi span a plane~~ and the transmitting beam spanning a plane perpendicular to the plane of polarization of the transmitting beam;

~~9.2 polarizing layers~~

P1 and ~~P2~~ a further polarizer being arranged along a first optical path S1~~, which is folded by n reflecting means (n=1,2,3,...)~~ such that the plane E1[[,]] ~~which~~ is spanned by V1 and the optical axis of S1 in P1, and the plane E2[[,]] ~~which~~ is spanned by ~~V2~~ the layer vector of said further polarizer and the optical axis of S1 in ~~P2~~ said further polarizer; ~~, have a correlation such that the mirrored plane E1*, which is derived from E1 by successive reflexions at said n reflecting means, is perpendicular to E2 (designated by the term „mutual complementarity" of P1 and P2),~~

said two polarizing layers being mutual complementary, characterized by the plane E1*, derived from E1 by optional means for folding, being perpendicular to E2;

~~9.3 polarizing layers~~

P1 and ~~P2~~ a further polarizer being arranged along a second optical path S2~~, which may be folded by n reflecting means (n=0,1,2,...)~~ such that the plane E3[[,]] ~~which~~ is spanned by V1 and the optical axis of S2 in P1, and a plane E4[[,]] ~~which~~ is spanned by ~~V2~~ the layer vector of said further polarizer and the optical axis of S2 in ~~P2~~ said further polarizer; ~~, have a correlation such that the mirrored plane E3*, which is derived from E3 by successive reflexions at said n reflecting means, is perpendicular to E4 (designated by the term „mutual complementarity" of P1 and P2),~~

said two polarizing layers being mutual complementary, characterized by the plane E3*, derived from E3 by optional means for folding, being perpendicular to E4;

~~9.4~~ said two optical paths S1 and S2 intersecting in P1 with equal intersecting angles between N1 and S1 and between N1 and S2[[,]];

~~9.5~~ the architecture of the system coupling the transmission at P1 ~~along S1~~ to a reflection at the further polarizer along S1 and the corresponding reflection

at P1 to a transmission at ~~P2~~ the further polarizer along S2.

10. (withdrawn amended) ~~Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distiguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) comprising ~~10.1 comprising~~ at least three polarizing layers Pi (i=1,2,3,..)[[,]];
~~each of~~ said ~~layers possessing~~ Pi characterized by a normal vector Ni normal to Pi and a polarizing layer vector Vi coplanar to Pi; [[,]]
said Pi having beam splitting properties, which split an incident beam into a transmitting and a reflected beam;
said Vi ~~together with the optical axis if incidence and reflection of Pi defining which directions of polarization of the electromagnetic radiation incident on Pi will be reflected (polarizing reflexion) resp. will transmit Pi (polarizing transmission) such that Vi together with the axis of reflexion of Pi span the plane of polarization of~~ and the reflected beam spanning the plane of polarization of the reflected beam;
~~and~~ said Vi ~~together with the axis of incidence of Pi span a plane~~ and the transmitting beam spanning a plane perpendicular to the plane of polarization of the transmitting beam;
~~10.2 polarizing layers~~
P1 and P2 being arranged along a first optical path S1~~, which is folded by n reflecting means (n=1,2,3,...)~~ such that the plane E1[[,]] is spanned by V1 and the optical axis of S1 in P1, and the plane E2[[,]] ~~which~~ is spanned by V2 and the optical axis of S1 in P2;~~, have a correlation such that the mirrored plane E1*, which is derived from E1 by successive reflexions at said n reflecting means, is perpendicular to E2 (designated by the term „mutual complementarity" of P1 and P2),~~
said polarizing layers P1 and P2 being mutual complementary, characterized by the plane E1*, derived from E1 by optional means for folding, being perpendicular to E2;
~~10.3 polarizing layers~~
P1 and P3 being arranged along a second optical path S2~~, which may be folded by n reflecting means (n=0,1,2,...)~~ such that the plane E3[[,]] ~~which~~ is spanned by V1 and the optical axis of S2 in P1, and a plane E4[[,]]~~which~~ is spanned by V3 and the optical axis of S2 in P3;~~, have a correlation such that the mirrored plane E3*, which is derived from E3 by successive reflexions at said n reflecting means, is perpendicular to E4 (designated by the term~~

~~„mutual complementarity" of P1 and P2),~~

said polarizing layers P1 and P3 being mutual complementary, characterized by the plane E3*, derived from E3 by optional means for folding being perpendicular to E4;

~~10.4~~ said two optical paths S1 and S2 intersecting in P1 with equal intersecting angles between N1 and S1 and between N1 and S2[[,]];

~~10.5~~ the architecture of the system coupling the transmission at P1 along S1 to a reflection at P2 and the corresponding reflection at P1 to a transmission at P3 along S2.

11. (withdrawn amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 10, comprising an additional fourth polarizing layer P4, which together with said P2 along a third optical path S3 and together with said P3 along a fourth optical path S4 constitutes an additional cross-polarizer according to claim 10.

12. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 1, at least one of said layers Pi being a doubled or two-sided cartesian polarizer with parallel layer vectors Vi.

13. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 1, all of said Pi being cartesian polarizers, e.g. wire grid polarizers.

14. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 1, all of said Pi being thin-film polarizers ~~working according to Brewster´s law~~ of the MacNeille type.

15. (currently amended) ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 1, all of said Pi being contained in a body and the optical paths into and out of the cross-polarizing system being made possible by windows or openings.

16. (currently amended) ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization

(cross-polarizer) according to claim 1, further comprising
~~16.1 comprising at least one cross-polarizing system according to claim 10,~~
~~16.2 comprising~~ at least ~~one~~ two spatial light modulators ~~in each channel,~~ ;
~~16.3 one of said cross-~~ said polariz~~inger~~ system[[s]] being used to feed the spatial light modulators with polarized light.

17. (currently amended) ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1, further comprising
~~17.1 comprising at least one cross-polarizing system according to claim 10,~~
~~17.2 comprising~~ at least ~~one~~ two spatial light modulators ~~in each channel,~~ ;
~~17.3 one of said cross-~~ said polariz~~inger~~ system[[s]] being used to superpose the modulated light from the spatial light modulators.

18. (currently amended) ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1, further comprising
~~18.1 comprising a cross-polarizing system according to claim 10,~~
~~18.2 comprising~~ at least ~~one~~ two spatial light modulator of the type micro-electro-mechanical-system (MEMS, e.g. DMD by Texas Instruments) ~~in each channel,~~ ;
~~18.3~~ said ~~cross-~~polariz~~inger~~ system being used to ~~both~~ feed the spatial light modulators with polarized light and to superpose the modulated light from the spatial light modulators[[,]]
~~18.4 the plane of incidence in said P1 intersecting the plane of superposition with an angle different from 0 degree~~.

19. (withdrawn amended) ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 9, further comprising
~~19.1 comprising a cross-polarizing system according to claim 9,~~
~~19.2 comprising~~ at least one spatial light modulator ~~in each channel~~ positioned in said optical paths S1 and S2 between P1 and P2.

20. (currently amended) ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 15, further comprising
~~20.1 comprising a cross-polarizing system according to claim 15,~~

~~20.1 comprising~~ at least one spatial light modulator ~~in each channel~~ which is mounted to the body.

21. (currently amended) Complex polarizer system for reciprocal polarization (cross-polarizer) ~~Cross-polarizing system~~ according to claim 1,
comprising at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle,~~ ;
said prism being ~~which is~~ composed of two right triangular sub-prisms with the base of an isosceles triangle each, ~~such that~~ with a thin-film type polarizing layer P1 with its layer vector V1 being ~~is~~ situated between these two sub-prisms[[,]]; ~~and~~
the lateral surface of the compound prism ~~that~~ which consists of two lateral surfaces of the sub-prisms[[,]] ~~carries~~ carrying a cartesian polarizing layer P2 with ~~the~~ its layer vector V2;
V2 being perpendicular to V1.

22. (currently amended) Complex polarizer system for reciprocal polarization (cross-polarizer) ~~Cross-polarizing system~~ according to claim 1,
comprising at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle,~~ ;
said prism being ~~which is~~ composed of two right triangular sub-prisms with the ~~footprint~~ base of an isosceles triangle each, ~~such that~~ with a cartesian type polarizing layer P1 with its layer vector V1 being ~~is~~ situated between these two sub-prisms[[,]]; ~~and~~
the lateral surface of the compound prism ~~that~~ which consists of two lateral surfaces of the sub-prisms[[,]] ~~carries~~ carrying a cartesian polarizing layer P2 with ~~the~~ its layer vector V2 ~~perpendicular to V1~~.

23. (currently amended) Complex polarizer system for reciprocal polarization (cross-polarizer) ~~Cross-polarizing system~~ according to claim 1, comprising
at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle,~~ ;
said prism being ~~which is~~ composed of two right triangular sub-prisms T1a, T1b with the ~~footprint~~ base of an isosceles triangle each[[,]];
~~such that~~ those lateral surfaces of the compound prism, which ~~that~~ consist[[s]] of only one lateral surface of the sub-prisms~~, carries~~ carrying polarization layers

P1 and P2.

24. (currently amended) Complex polarizer system for reciprocal polarization (cross-polarizer) ~~Cross-polarizing system~~ according to claim 1, comprising
at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle,~~ ;
aid prism being ~~which is~~ composed of two right sub-prisms with the ~~footprint~~ base of an isosceles triangle each[[,]];
~~such that a~~ thin-film type polarizing layer P1 ~~is~~ being situated between these two sub-prisms.

25. (currently amended) Complex polarizer system for reciprocal polarization (cross-polarizer) ~~Cross-polarizing system~~ according to claim ~~10~~ 1,
all cartesian polarizing layers being doubled or two-sided.

26. (new) Method of using a cross-polarizer according to claim 1.

27. (new) Method for reciprocal polarization (cross-polarization),
using a light source;
using three polarization beam splitting layers $P_{trans1ref1}$, with a polarizing layer vector $V_{trans1ref1}$, P_{ref2}, with a polarizing layer vector V_{ref2}, and P_{trans2}, with a polarizing layer vector V_{trans2};
using the optical axis A_{trans1} and the optical axis A_{ref1} which is derived from A_{trans1} by mirroring A_{trans1} at the plane of $P_{trans1ref1}$;
using a polarized beam $B_{trans1ref2}$, which transmits $P_{trans1ref1}$ along A_{trans1}, located between $P_{trans1ref1}$
using a polarized beam $B_{ref1trans2}$, which is reflected at $P_{trans1ref1}$ along A_{ref1};
arranging $B_{trans1ref2}$ and $B_{ref1trans2}$ such that they form a common beam with both polarization components of $B_{trans1ref2}$ and $B_{ref1trans2}$ on one side of $P_{trans1ref1}$;
choosing $V_{trans1ref1}$ such that the plane of polarization of $B_{trans1ref2}$ is perpendicular to the plane spanned by $V_{trans1ref1}$ and A_{trans1}, and that the plane of polarization of $B_{ref1trans2}$ is spanned by A_{ref1} and $V_{trans1ref1}$;
guiding $B_{trans1ref2}$ on an optical path between $P_{trans1ref1}$ and P_{ref2};
arranging P_{ref2} such that the optical path of $B_{trans1ref2}$ leads to P_{ref2} in the optical axis A_{ref2};
arranging P_{ref2} such that $B_{trans1ref2}$ is reflected at P_{ref2} by choosing V_{ref2} such that

the plane of polarization of $B_{trans1ref2}$ is spanned by A_{ref2} and V_{ref2}, therefore coupling the transmission of $B_{trans1ref2}$ at $P_{trans1ref1}$ to a reflection of $B_{trans1ref2}$ at P_{ref2};

guiding $B_{ref1trans2}$ on an optical path between $P_{trans1ref1}$ and P_{trans2};

arranging P_{trans2} such that the optical path of $B_{ref1trans2}$ leads to P_{trans2} in the optical axis A_{trans2};

arranging P_{trans2} such that $B_{ref1trans2}$ transmits at P_{trans2} by choosing V_{trans2} such that the plane of polarization of $B_{ref1trans2}$ is perpendicular to the plane spanned by A_{trans2} and V_{trans2}, therefore coupling the reflection of $B_{ref1trans}$ at $P_{trans1ref1}$ to a transmission of $B_{ref1trans2}$ at P_{trans2}.

28. (new) Method for reciprocal polarization (cross-polarization),

using a light source;

using four polarization beam splitting subprocesses (either a polarizing transmission or a polarizing reflection of a common polarization split process) P_{trans1}, P_{ref1}, P_{ref2}, P_{trans2};

using a polarized beam $B_{trans1ref2}$, transmitting at the process P_{trans1};

using a polarized beam $B_{ref1trans2}$, which is reflected at P_{ref1};

said P_{trans1} and P_{ref1} subprocesses being the polarizing transmission subprocess and polarizing reflection subprocess of a common polarization split process;

sending $B_{trans1ref2}$ through the polarizing reflection subprocess P_{ref2}, thus coupling the polarizing transmission P_{trans1} of $B_{trans1ref2}$ to the polarizing reflection P_{ref2} of $B_{trans1ref2}$;

sending $B_{ref1trans2}$ through the polarizing transmission subprocess P_{trans2}, thus coupling the polarizing reflection P_{ref1} of $B_{ref1trans2}$ to the polarizing transmission P_{trans2} of $B_{ref1trans2}$.